

Amendments to the Title:

Please amend the title of the invention to read, as follows.

TONER SUPPLYING CONTAINER WITH SHUTTER POSITION/DETECTION
PORTION SENSOR FEATURE AND IMAGE FORMING APPARATUS INCLUDING
THE SAME

Amendments to the Specification:

Please amend the paragraphs starting at page 2, line 24 and ending at page 3, line 4 to read, as follows.

The toner bottles 15 are provided with operating levers (hereinafter referred to as the bottle knobs) 1 (1m, 1c, 1y), and by these bottle knobs 1 being operated, the toner bottles 15 ~~[[1]]~~ can be fixed/released relative to the rotary member 51.

The toner bottles 15 are inserted and removed in the direction of the rotary shaft of the rotary member 51 (the direction of arrow A in Fig. 3).

Please amend the paragraphs starting at page 3, line 9 and ending at page 5, line 6 to read, as follows.

The reference numeral 11 designates the apparatus main body, and the reference numeral 12 denotes an opening for interchanging the toner bottles 15 therethrough.

When the toners become exhausted during an image forming operation, the apparatus discontinues image forming and calls upon the user to interchange the toner bottle 15 by a message or the like on ~~[[to]]~~ the display of an operating portion.

The user opens the front cover (not shown) of the apparatus and has access to the opening ~~portion~~ 12. The user ~~[[He]]~~ rotates the bottle knob 1 by a predetermined angle to thereby release the toner bottle 15 from the rotary member 51. Then, the user ~~[[he]]~~ draws out the toner bottle 15 toward the ~~[[this]]~~ side of the apparatus.

Even in an apparatus having toner bottles 15 of a plurality of colors, the number of the opening 12 for interchanging the toner bottles 15 therethrough is one.

This is because in the actually used state of the apparatus, it is rare that the toners of a plurality of colors become exhausted at the same ~~[[a]]~~ time.

Further, if a plurality of interchange doors are provided, it will become possible for the user to have access to the plurality of toner bottles 15 and therefore, the toner bottle 15 to be interchanged will be difficult to recognize. Consequently, it is more advantageous to the user that a toner bottle 15 in which the toner has become exhausted waits in the opening 12. ~~portion.~~

The toner bottle 15 will now be described with reference to Figs. 5A and 5B of the accompanying drawings. Fig. 5A is a front view of the toner bottle 15. ~~bottle.~~ Fig. 5B is a perspective view of a portion of the toner bottle 15. ~~bottle.~~

The reference numeral 2 designates a toner containing portion, and the reference numeral 3 denotes a shutter. The letter S designates a reflection type sensor provided in the apparatus main body 11. ~~body,~~ and the reference character 1a denotes a reflecting surface for reflecting light emitted from the sensor S. ~~sensor.~~

The bottle knob 1 has a rotary shaft parallel to the rotary shaft of the rotary member 51, and the bottle knob 1 is rotated by a predetermined amount to thereby fix or release the toner bottle 15 relative to the rotary member 51. Simultaneously therewith, the opening and closing of the shutter 3 provided in the communicating portion between the toner bottle 15 and the developing device 52, or between the toner bottle 15 and an intermediate hopper portion (not shown) are also effected (see Japanese Patent Application Laid-Open No. H11-194600).

Please amend the paragraph starting at page 5, line 19 and ending at page 5, line 23 to read, as follows.

When the user rotates the bottle knob 1, the reflecting surface 1a comes off from the detection area of the sensor S, whereby it can be detected that the user has rotated the bottle knob 1 or that the toner bottle 15 is in its drawn-out state.

Please amend the paragraphs starting at page 6, line 16 and ending at page 7, line 7 to read, as follows.

- When the detecting surface of the reflection type sensor S is stained, to clean it, it is necessary to detach a single piece of the sensor S or the sensor unit from the apparatus main body 11, ~~body~~, and this leads to a bad working property.

- Usually, after the toner bottle 15 has been interchanged, the user enters the recovery operation of rotating the rotary member 51 several times or rotating the photosensitive member. However, judgment as to whether the toner bottle 15 has been interchanged can be effected only by a front cover opening-closing detection signal (usually the front cover is provided with a sensor for detecting the opening and closing thereof) and therefore, when the user has opened and closed the front cover for some reason or other without interchanging the toner bottle 15, ~~bottle~~, the user performs the recovery operation in spite of the toner bottle 15 having not been interchanged.

Please amend the paragraph starting at page 7, line 26 and ending at page 7, line 27 to read, as follows.

(5) The user draws out the toner bottle 15 toward this side of the apparatus.

Please amend the paragraph starting at page 8, line 7 and ending at page 8, line 11 to read, as follows.

(1) When the toner becomes exhausted during the image forming operation, the apparatus discontinues image forming, and calls upon the user to interchange the toner bottle 15 by a message on ~~[[to]]~~ the display of the operating portion.

Please amend the paragraphs starting at page 8, line 17 and ending at page 8, line 24 to read, as follows.

(4) to (6) (There is no change during the user's interchange of the toner bottle 15.)
bottle.)

(7) The sensor S receives reflected light from the reflecting surface 1a to thereby detect the fixing of the toner bottle 15. ~~bottle.~~ In response to the signal, the display of the operating portion is changed over to display for calling upon the user to close the front cover.

Please amend the paragraphs starting at page 9, line 12 and ending at page 9, line 20 to read, as follows.

(3) However, the user ~~[[he]]~~ becomes aware that they have ~~he has~~ prepared a toner bottle of a wrong color, and again closes the front cover.

(4) The user ~~[[He]]~~ has prepared a right bottle, but cannot immediately interchange with it because the apparatus is in operation.

(5) Toner absence is again displayed and the interchange of the toner bottle 15 is resumed (thereafter, normal action takes place).

Please amend the paragraph starting at page 9, line 23 and ending at page 9, line 27 to read, as follows.

(1) When the toner becomes exhausted during the image forming operation, the apparatus discontinues image forming, and calls upon the user to interchange the toner bottle 15 by a message or the like on [[to]] the display of the operating portion.

Please amend the paragraph starting at page 10, line 3 and ending at page 10, line 6 to read, as follows.

(3) A signal for closing the front cover is again detected, and it is judged that the toner bottle 15 has been interchanged, and the display of the operating portion is returned to the ordinary display.

Please amend the paragraphs starting at page 10, line 9 and ending at page 10, line 25 to read, as follows.

5) Image forming is resumed, but the toner bottle 15 has not been interchanged and therefore, toner absence is immediately displayed.

If as described above, only the detection of the opening and closing of the front cover is used as a judgment signal for the interchange of the toner bottle 15, ~~bottle~~, when the user performs abnormal action, the display of the operating portion is returned to the ordinary display or the recovery operation is repeated many times, in spite of the toner bottle 15 having not been interchanged.

To solve this, it is conceivable to discretely provide detecting means capable of detecting the presence or absence of the toner bottle 15 itself, but this will result in the rise of the cost of the apparatus and the complication of the apparatus, and is not advisable.

Please amend the paragraph starting at page 13, line 11 and ending at page 13, line 13 to read, as follows.

Fig. 2 shows a situation immediately before a toner bottle [[15]] is mounted on the mounting portion of an image forming apparatus.

Please amend the paragraph starting at page 13, line 25 and ending at page 14, line 9 to read, as follows.

A first embodiment of the present invention will hereinafter be described with reference to Figs. 1A and 1B. The construction of a toner bottle 15 is substantially similar to the construction described in the foregoing example of the conventional art except the construction of the portion to be detected. Accordingly, the functionally same regions as those in the example of the conventional art are given the same reference characters and need not be described in detail. Figs. 1A and 1B are schematic views of a portion of an image forming apparatus to which the present invention can be applied.

Please amend the paragraph starting at page 14, line 18 and ending at page 14, line 26 to read, as follows.

Fig. 1A is a front view showing a state in which the bottle interchange door 13 is opened, and Fig. 1B is a perspective view thereof. The reflection type sensor 14 is

installed on the inner surface of the bottle interchange door 13 so as to correspond to the portion to be detected of a bottle knob 1 when the bottle interchange door 13 is pivotally moved in the direction of arrow D and closed.

Please amend the paragraph starting at page 15, line 24 and ending at page 16, line 17 to read, as follows.

Further, the toner bottle 15 is provided with a bottle knob 1 as a rotating member provided for pivotal movement relative to the bottle body 15A. This bottle knob 1 is designed such that at a point of time before the toner bottle 15 is mounted in the image forming apparatus, a lock portion provided on the bottle knob 1 is locked to the portion to be locked of the bottle body 15A and becomes substantially unrotatable. On the other hand, design is made such that when the toner bottle 15 is mounted in the image forming apparatus, the lock portion of the bottle knob 1 strikes against the image forming apparatus and is displaced, whereby the locking thereof to the portion to be locked of the bottle body 15A is released and the pivotal movement of the bottle knob 1 in a direction B is permitted relative to the bottle body 15A. This construction makes it possible that at this state, a user grasps a grip (a portion on which a reflecting surface 1b is provided as described later in conjunction with Fig.2) of the bottle knob 1 to rotate the bottle knob 1.

Please amend the paragraphs starting at page 16, line 23 and ending at page 17, line 16 to read, as follows.

The gear portion 3A of the shutter 3 and the gear portion 1A of the bottle knob 1 are not drive-connected to each other at a point of time before the toner bottle 15 is mounted in the image forming apparatus.

These two gear portions 1A and 3A, ~~portions~~, however, are designed to be drive-connected to drive transmitting gears 100A and 100B as drive transmitting means 100 disposed on the mounting portion of the image forming apparatus when the toner bottle 15 is mounted in a direction A toward the image forming apparatus. The drive transmitting means 100 has a gear 100C rotatable coaxially with the gear 100A on the back side of the gear 100A, but this gear 100C is hidden behind the gear 100A in Fig. 2.

Accordingly, design is made such that when the gears 100A and 100C are rotated, the gear 100B ~~[[B]]~~ which is in meshing relationship with the gear 100C is rotated. That is, the gear 100A and the gear 100B are brought into drive-connected relationship with each other through the gear 100C.

Please amend the paragraph starting at page 17, line 22 and ending at page 18, line 8 to read, as follows.

When in a state in which the gear portion 3A and the gear portion 1A have been drive-connected to each other as described above, the bottle knob 1 is pivotally moved by a predetermined angle in the direction B, a rotating force produced by this pivotal movement of the bottle knob 1 is transmitted to the gear portion 3A of the shutter 3 through the drive transmitting means 100, and the shutter 3 is moved in a direction X to a position for opening the toner discharging port. The bottle knob 1 being in the thus pivotally moved

position is designed to strike against the mounting portion of the image forming apparatus so that the toner bottle 15 may not be drawn out by mistake.

Please amend the paragraph starting at page 18, line 18 and ending at page 18, line 22 to read, as follows.

The toner bottle 15 is designed to be mounted to and detached from the image forming apparatus only when the shutter 3 is in its closed state, that is, only when the bottle knob 1 is in a posture in which it has closed shutter 3 (a posture before mounting).

Please amend the paragraphs starting at page 18, line 26 and ending at page 20, line 4 to read, as follows.

Next, the bottle knob 1 is provided with a reflecting surface 1b as a portion to be detected for reflecting light emitted from the light emitting element of the reflection type sensor 14 toward the light receiving element of the reflection type ~~optical~~ sensor 14 (has a light-reflecting tape stuck thereon). This reflecting surface 1b is provided on a surface along a direction perpendicular to a toner bottle mounting direction A.

This reflection type sensor 14 is designed to detect that the bottle knob 1 is in a position in which it has been pivotally moved by a predetermined angle to open the shutter 3. At the same time, this reflection type sensor 14 also has the function of detecting whether the toner bottle 15 is mounted in the image forming apparatus.

That is, design is made such that when in a state in which the bottle knob 1 has closed the shutter 3, the bottle interchange door 13 is closed, the light emitted from the light emitting element of the reflection type sensor 14 to the toner bottle 15 is hardly

reflected by the toner bottle 15 and sufficient light is not incident on the light receiving element of the reflection type sensor 14.

Also, design is made such that when the bottle interchange door 13 is closed with the toner bottle 15 not mounted in the image forming apparatus, light emitted from the reflection type sensor 14 toward a space (mounting portion) for mounting the toner bottle 15 is hardly reflected by the inner port side of this space and sufficient light is not incident on the light receiving element of the reflection type sensor 14.

Please amend the paragraph starting at page 20, line 14 and ending at page 20, line 19 to read, as follows.

The reflecting surface 1b is a surface perpendicular to the rotary shaft of the rotary member 51 and also perpendicular to the rotary shaft of the bottle knob 1. These two rotary shafts are parallel with ~~[[to]]~~ each other and are also parallel to the ground.

Please amend the paragraphs starting at page 20, line 23 and ending at page 21, line 18 to read, as follows.

By adopting such an arrangement, it is possible to make a construction difficult for the toner to adhere to and stain the reflecting surface 1b.

Further, even if the reflecting surface 1b should be stained, an operator can readily perform the cleaning of this reflecting surface 1b because of a construction in which the reflecting surface 1b becomes exposed with the opening 12 of the bottle interchange door 13.

Also, the optical sensor 14 is provided on the inner surface of the bottle interchange door 13 and even though it is inside the image forming apparatus, it is near to the external portion side and therefore, it is of a construction in which it is difficult for the toner to adhere to and stain it.

Further, even if a transparent window portion provided so as to cover the light emitting element and light receiving element of the optical sensor should be stained with [[the]] toner, the operator can readily perform the cleaning of the reflecting surface 1b because of a construction in which the window portion is opened with the bottle interchange door 13 and the reflecting surface 1b becomes exposed.

Please amend the paragraph starting at page 21, line 20 and ending at page 21, line 26 to read, as follows.

A description ~~Description~~ will first be made of the user's operation. The following is a normal procedure.

(1) During the image forming operation, the toner becomes exhausted and image forming is discontinued and therefore, the user is called upon to interchange the toner bottle 15 by a message on the display of the operating portion.

Please amend the paragraph starting at page 23, line 6 and ending at page 23, line 7 to read, as follows.

(4) to (7) (There is no change during the user's interchanging of the toner bottle 15.) bottle.)

Please amend the paragraphs starting at page 24, line 1 and ending at page 24, line 6 to read, as follows.

(3) The user, however, becomes aware of having prepared a toner bottle 15 of a wrong color, and again closes the front cover.

(4) The user prepares a right toner bottle 15, ~~bottle~~, and again opens the front cover. (Thereafter, the user performs normal action.)

Please amend the paragraph starting at page 24, line 16 and ending at page 24, line 22 to read, as follows.

(3) A signal for the closing of the front cover is detected again. There has been no opening-closing detection signal of the bottle interchange door 13 and therefore, the display of the operating portion continues to display the message calling upon the user to interchange the toner. The apparatus neither performs the recovery operation.

Please amend the paragraph starting at page 24, line 25 and ending at page 25, line 2 to read, as follows.

As described above, as long as the bottle interchange door 13 is not opened and closed, the display of the operating portion is maintained on the toner interchange display, and an unnecessary recovery operation is not performed.

Please amend the paragraphs starting at page 25, line 25 and ending at page 28, line 16 to read, as follows.

This lever is pivotally moved, whereby the opening and closing of the shutter of the toner bottle are effected. Also, in the case of a process cartridge, this lever is pivotally moved, whereby the fixing (locking and the (locking)/the release of fixing thereof to the apparatus is effected. A reflecting surface as a portion to be detected is provided on an end surface of this lever, and an optical sensor is provided on the inner surface of the interchange door so as to correspond to this reflecting surface. Even in such a construction, the toner stain on the optical sensor can be reduced as much as possible, and the cleaning of the optical sensor can be done easily.

As described above, the sensor 14 is far from a portion handling the toner and the detecting surface 1b of the bottle knob 1 is substantially parallel with ~~[[to]]~~ a vertical direction and therefore, it is difficult for the toner to adhere to and stain the detecting surface 1b. surface. Further, when the detecting surface 1b is stained, it can be cleaned easily if the bottle interchange door 13 is opened, and this leads to a good working property.

Also, the sensor 14 can not only detect whether the toner bottle 15 is properly set, but also detect the opened and closed states of the bottle interchange door 13 because a detection signal is operatively associated with the opening and closing of the bottle interchange door 13. door. On the basis of the detection signal, a message to the operating portion which is a liquid crystal display portion provided on the upper portion of the image forming apparatus can be changed over, and fair judgment as to whether the user has interchanged the toner bottle 15 can be passed.

Also, the reflecting surface 1b of the bottle knob is provided on this side with respect to the mounting direction of the toner bottle 15, bottle, whereby it becomes difficult

for the user to touch this reflecting surface 1b when they perform ~~he performs~~ the operation of mounting or dismounting the toner bottle 15, bottle, and such a problem as faulty reflection attributable to the damaging of the reflecting surface 1b or the stain of the reflecting surface 1b can be prevented.

While in the above-described embodiment, the optical sensor 14 detects the position of the bottle knob 1 to thereby detect the opening and closing of the shutter 3 and the presence or absence of the mounting of the toner bottle 15, bottle, such an example is not restrictive, but such a construction as will be described next may be adopted. For example, a construction in which a similar reflecting surface 1b is provided on the side edge portion of the shutter 3 and it is detected by the optical sensor 14 can also obtain a similar effect. However, when the cleanability of the reflecting surface 1b is taken into consideration, the construction in which the reflecting surface 1b is provided on the bottle knob 1 is more preferable.

As described above, according to the above-described embodiment, the toner stains of the sensor 14 and the portion to be detected can be prevented. Also, even if the toner adheres to them, it becomes possible to readily effect the cleaning of them.

Further, both of the opening and closing of the shutter 3 and the presence or absence of the mounting of the toner bottle 15 can be detected by a single optical sensor 14 to thereby achieve a reduction in the cost of the image forming apparatus. That is, there can be provided a toner bottle 15 corresponding to such a reduction in the cost of the image forming apparatus.

The detection of the opened and closed states of the bottle interchange door 13 also becomes possible by this optical sensor 14 and the more simplification of the construction can be achieved.